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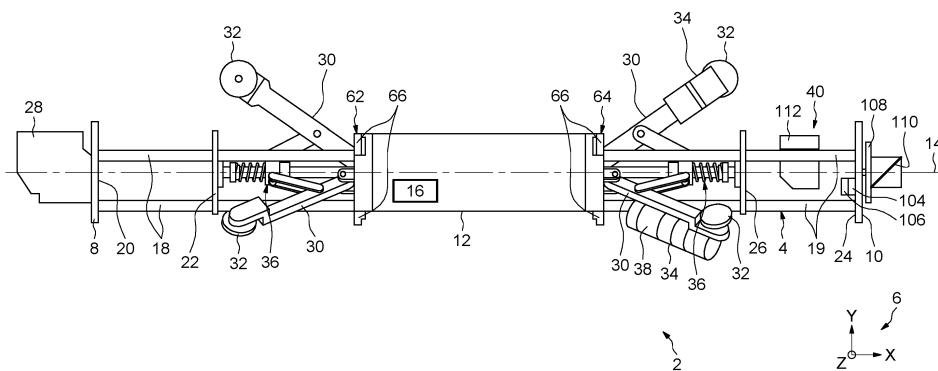
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(54) DRIFTING DEVICE AND METHOD FOR TUBULAR GOODS

(57) This drifting device (2) for a tubular good includes a body (12), a means of propelling the body (12) through the tubular good, and at least one attachment part (66) for attaching a cylindrical mandrel to the body

(12), wherein the attachment part (66) is so configured to enable a degree of mobility of the cylindrical mandrel with respect to the body (12) along a radial direction.

FIG.1



Description

[0001] The present invention relates to the technical field of drifting devices for tubular goods, in particular for oil country tubular goods.

[0002] Tubular goods manufacturers, especially in the field of oil and gas, need to meet specific quality requirements concerning internal parameters, such as the traversability.

[0003] The traversability is the capability, for a tubular good, to be passed through by an equipment. In order to control the traversability, a drifting device, also known as a drift mandrel, aims at controlling the free pass in the internal diameter of the tubular good. A drifting device typically includes a cylindrical mandrel being a test piece of a given diameter and a given length. The cylindrical mandrel acts as a gauge to know if an equipment of a given maximum dimension can go through the tubular good.

[0004] Conventionally, the cylindrical mandrel is pushed or pulled inside the tubular good. Two ropes are attached to each respective end of the cylindrical mandrel, and two operators pull on the two respective ropes. If and only if the cylindrical mandrel can be passed through the tube on its whole length, the traversability of the tubular good is correct.

[0005] A drawback of such a process is that it requires at least two operators to perform the drifting process, and that a significant effort is required from the operators to pass the cylindrical mandrel through the whole length of the tubular good.

[0006] The invention aims at overcoming the above-mentioned drawback.

[0007] More specifically, the invention aims at allowing to verify the traversability of a tubular good in a way that requires less than two operators and that decreases a required effort to implement the traversability tests.

[0008] Also, there are increasing demands to know internal diameters of the tubular good along its axis. Ultrasonic inspections from exterior of the tubular good can be done in mills to retrieve such data. Nevertheless, this equipment is too bulky on the field.

[0009] Also, applicant found an operational advantage to combine both internal diameter measurements and drift operations. Gain of time and need for operators' interventions are decreased. The drifting device of the present invention allows to combine both drift measure and internal diameter measurements in one passage of equipment inside the tubular, by allowing combining the cylindrical drifting mandrel and the internal diameter measuring equipment to be mounted on the same device in such a manner both combining the cylindrical drifting mandrel and the internal diameter measuring equipment can operate simultaneously.

[0010] According to a first aspect of the invention, it is proposed a drifting device for a tubular good including a body, an actuator for propelling the body through the tubular good, and at least one attachment part for attaching

a cylindrical mandrel to the body, wherein the attachment part is so configured to enable a degree of mobility of the cylindrical mandrel with respect to the body along a radial direction.

[0011] Such an attachment part allows displacing the cylindrical mandrel without requiring to pull it by means of a transmission means such as a rope. Enabling a degree of mobility avoids generating wrong results. Roundness and/or traversability inspection of the tubular good is thus rendered easier in a reliable manner.

[0012] In the present application, the word "attach" shall be understood according to its common definition, that is securing at least one degree of mobility of a part with respect to another part.

[0013] In one embodiment, the attachment part is so configured to enable a degree of rotation of the cylindrical mandrel around a first radial direction, a degree of rotation of the cylindrical mandrel around a second radial direction, the second radial direction being not parallel

20 to the first radial direction, a degree of translation of the cylindrical mandrel along the first radial direction and a degree of translation of the cylindrical mandrel along the second radial direction.

[0014] The attachment part thus facilitates in an optimal manner the displacement of the cylindrical mandrel inside the tubular good.

[0015] One may also foresee a distance sensor for measuring an inner diameter of the tubular good and/or a length of the tubular good.

[0016] In this way, the drifting device allows implementing measures typical of internal inspection of oil country tubular goods. The work of the operator is even more facilitated and the time for inspection is decreased.

[0017] One may also foresee an elastic means including a spring.

[0018] Preferably, the elastic means includes a helical spring.

[0019] Such an elastic means allows enabling the freedom of motion along the degrees of mobility in a simple and robust manner.

[0020] In another embodiment, the attachment part includes a contact surface intended to be in axial contact with an axial surface of the cylindrical mandrel.

[0021] Preferably, the contact surface is tapered.

[0022] Such an embodiment allows easily centering the cylindrical mandrel around an axis of revolution of the tapered surface.

[0023] In another embodiment, the body includes an opening, the attachment part being received in the opening and including a locking device for releasably preventing the attachment part from leaving the opening.

[0024] One may also foresee that the body is elongated, the attachment part including a frontal surface perpendicular to a longitudinal direction of the body, the frontal surface including a circular outer edge, the attachment part including a cylindrical surface having a generatrix oriented in the longitudinal direction and extending from the circular outer edge, and a shoulder perpendicular to

the longitudinal direction and extending outwards from the cylindrical surface.

[0025] With such a design of the drifting device, the frontal surface may be in axial contact with a shouldering portion of the cylindrical mandrel, the shoulder may be in axial contact with the axial surface and the cylindrical surface may be in radial contact with a cylindrical face of the cylindrical mandrel. Handling of the cylindrical mandrel is thus implemented in an optimal manner.

[0026] One may also foresee a plurality of attachment parts forming a first attachment set and a second attachment set, the first and second attachment sets being axially spaced apart from each other. Such a design allows attaching the cylindrical mandrel irrespective of an advance direction of the drifting device.

[0027] In one embodiment, each attachment set includes at least three attachment parts regularly distributed over the circumference of the body.

[0028] Such an attachment set allows firmly attaching the cylindrical mandrel to the body.

[0029] In another embodiment, each attachment set consists of three attachment parts.

[0030] Hence, an isostatic fixation of the cylindrical mandrel to the body may be implemented.

[0031] One may also foresee a cylindrical mandrel attached to the body via the attachment part.

[0032] One may also foresee an adapter comprising an outer portion directly attached to an axial end of the cylindrical mandrel and an inner portion in direct contact with the attachment part.

[0033] Such an adapter allows attaching a cylindrical mandrel having relatively large dimensions to a drifting device intended to be used with cylindrical mandrels having relatively small dimensions. Hence, several types of tubular goods may be inspected by means of one drifting device.

[0034] One may also foresee a metering device for metering an inner diameter of the tubular good.

[0035] Preferably, the metering device comprises a laser triangulation sensor.

[0036] In another embodiment, the metering device includes a laser triangulation sensor and a plate pivoting around an axial direction.

[0037] Preferably, the metering device includes an inclined mirror mounted on the plate.

[0038] Such a sensor allows accurately determining the inner diameter of the tubular good while avoiding it to be excessively costly.

[0039] In another embodiment, the laser triangulation sensor is mounted on the plate, the metering device preferably including another laser triangulation sensor mounted on the plate, the laser triangulation sensors being diametrically opposed to each other.

[0040] Such a metering device increases even more the accuracy of the inner diameter determination.

[0041] Preferably, the triangulation sensor includes a laser line emitter.

[0042] Such a laser sensor allows determining the in-

ner diameter in a more accurate manner.

[0043] Since the same internal inspecting device may be used for performing two measures at the same time, the work of an operator in charge of internal inspecting of a tubular good is rendered easier and faster.

[0044] According to another aspect of the invention, it is proposed a drifting method for verifying internal dimension of a tubular good, wherein a cylindrical mandrel is attached to an attachment part of a drifting device as defined above, and the drifting device is propelled inside the tubular good.

[0045] Hence, the traversability of the tubular good may be inspected without requiring a cylindrical mandrel to be manually handled by an operator.

[0046] One may also foresee a step of measuring an internal diameter of the tubular good and/or a length of the tubular good, the steps of measuring and the step of propelling the drifting device inside the tubular good being performed simultaneously.

[0047] The present invention and its advantages will be better understood by studying the detailed description of specific embodiments given by way of nonlimiting examples and illustrated by the appended drawings on which:

- 25 - figure 1 is a side view of a drifting device according to a first embodiment of the invention,
- figure 2 is a side view of the drifting device of figure 1 including a cylindrical mandrel,
- 30 - figure 3 is a cross-sectional view of the cylindrical mandrel of figure 2,
- figures 4A, 4B, 4C and 4D are detail views, isometric and in partial cross section, of an attachment part of the drifting device of figures 1 and 2,
- 35 - figure 5 is a front view of an adapter of the drifting device of figure 1,
- figure 6 is a detail view, in cross section, of an attachment part of a drifting device according to a second embodiment of the invention, and
- 40 - figure 7 is a detailed view of a drifting device according to a second embodiment of the invention.

[0048] With reference to figure 1, it is schematically depicted a drifting device 2. The drifting device 2 aims at 45 controlling internal parameters of a tubular good (not depicted), for instance the traversability and/or the roundness of an oil country tubular good.

[0049] The drifting device 2 includes a main part 4. The main part 4 is elongated. The main part 4 includes two 50 opposite ends 8 and 10.

[0050] It is defined an orthonormal direct vector basis 6 attached to the main part 4. The basis 6 consists of a vector X, a vector Y and a vector Z. The vector X is parallel to a longitudinal direction of the main part 4.

[0051] The main part 4 includes a body 12. The body 12 forms a cylinder of revolution about an axis 14 parallel to the vector X and having a diameter d_{12} . The body 12 accommodates electronics 16 of the drifting device 2.

[0052] In the present application, the word "cylindrical" and variations thereof will be understood according to its common definition, being namely that a cylindrical surface is a surface consisting of all the points on all the lines which are parallel to a given line and which pass through a fixed plane curve in a plane not parallel to the given line.

[0053] In the present application, unless specified otherwise, the terms "axial", "radial", "tangential" and variations thereof will be understood referring relative to the axis 14.

[0054] The main part 4 includes a plurality of, e.g. three structural rods 18 and a plurality of, e.g. three structural rods 19 attached to the body 12. The structural rods 18 and 19 are cylindrical along the direction of the vector X. In the depicted embodiment, the structural rods 18 and 19 are cylinders of revolution having the same diameter d_{18} . The structural rods 18 and 19 are respectively located on each side of the body 12.

[0055] The main part 4 includes two structural plates 20 and 22 attached to the structural rods 18. The structural plate 20 is positioned proximate to the end 8. The structural plate 22 is positioned axially between the structural plate 20 and the body 12. The main part 4 includes two structural plates 24 and 26 attached to the structural rods 19. The structural plate 24 is positioned proximate to the end 10. The structural plate 26 is positioned axially between the structural plate 24 and the body 12. The plates 20, 22, 24 and 26 are cylinders of revolution around the axis 14 and having the diameter d_{12} .

[0056] The drifting device 2 includes a battery 28 attached to the structural plate 20. The battery 28 is electrically linked to the body 12 so as to provide the electronics 16 with electrical energy.

[0057] In order to propel the main part 4 in a tubular good, the drifting device 2 includes a plurality of, e.g. six pivoting arms 30. Namely, three pivoting arms 30 are provided at one end of the body 12 and three pivoting arms 30 are provided at the other end of the body 12. Each pivoting arm 30 includes an end mechanically linked to the body 12, and another end including a wheel 32 intended to contact radially an inner cylindrical surface of the tubular good. The mechanical link between the pivoting arms 30 and the body 12 allows the pivoting arm 30 to rotate, with reference to the body 12, around respective tangential axes.

[0058] The drifting device 2 further includes a plurality of, e.g. two electric motors 34 mounted on two of the six pivoting arms 30. The electric motors 34 are able to drive the wheels 32 of the corresponding pivoting arms 30 in rotation. When the wheels 32 are in a regular contact with an inner cylindrical surface of the tubular good, the rotation of the wheels 32 results in a propulsion of the body 12 inside the tubular good.

[0059] The drifting device 2 includes two elastic return assemblies 36 respectively associated to the structural plates 22 and 26. The elastic return assemblies 36 include each a cylinder of revolution secured to the respec-

tive plate 22 or 26 and secured to the body 12, a spring mounted on the cylinder of revolution, a sleeve pushed towards the body 12 by the spring and a plurality of connecting rods rotatably attached to the respective pivoting arms 30. Hence, the elastic return assemblies 36 allow pivoting the arms 30 in a way tending to move the wheels 32 radially outwards, with respect to the axis 14.

[0060] The drifting device 2 further includes a length encoder 38. The length optical encoder 38, in a known manner per se, is able to measure the rotation of the wheel 32 and to convert this rotation into a distance of the displacement of the body 12 inside the tubular good. Hence, the length optical encoder 38 allows measuring the length of the tubular good.

[0061] The drifting device 2 includes a metering device 40 attached to the main part 4 proximate to the end 10.

[0062] The metering device 40 includes an electric motor 104 and a plate 108 driven by the electric motor 104 in rotation around the axis 14 with respect to the main part 4. An encoder 106 allows having permanently a measure of the angular position of the plate 108. The encoder 106 may be a revolution encoder. The encoder 106 may be a revolution optical encoder.

[0063] The metering device 40 includes an inclined mirror 110. The mirror 110 is supported by the plate 108. Namely, the mirror 110 is substantially plane and forms an angle about 45° with respect to the axis 16.

[0064] The metering device 40 comprises a laser triangulation sensor 112 able to emit a laser beam along the axis 14. The laser beam reflects in the mirror 110 and is thus radially directed. Then, the laser beam may reflect against an inner cylindrical surface of the tubular good, then revert back into the mirror 110, be directed along the axis 14 and be detected by the laser triangulation sensor 112. By virtue of this arrangement, the distance between the axis 14 and the point of reflection of the laser beam on the inner surface of the tubular good may be measured. Thus, the inner diameter of the tubular good may be determined with accuracy.

[0065] In the depicted embodiments, the laser sensor 112 is a laser line emitter. Hence, the accuracy of the distance measurements by means of this sensor is even more increased.

[0066] The metering device 40 includes a laser triangulation sensor 112 able to emit a laser beam along the direction of the axis 14, a plate pivotable, with respect to the structural plate 24, around the direction of the axis 14, and an inclined mirror secured to the plate. The mirror forms an angle, with respect to the axis 14, about 45°. By virtue of this arrangement, the metering device 40 may meter an inner diameter of the tubular good.

[0067] Referring now to figure 2, the drifting device 2 includes a cylindrical mandrel 42. The cylindrical mandrel 42 forms a cylinder of revolution around an axis 43. When the cylindrical mandrel 42 is at its relaxed position as depicted on figure 2, the axis 43 is at the same location as the axis 14.

[0068] Referring now to figures 2 and 3, the cylindrical

mandrel 42 includes an outer surface 44 and an inner surface 46. The surfaces 44 and 46 form two cylinders of revolution around the axis 43. The cylindrical mandrel 42 includes two axial ends 48 and 50, with respect to the axis 43. At each end 48, 50, the cylindrical mandrel 42 includes an axial surface 52 with respect to the axis 43, a cylindrical face 54 extending from an inner edge 56 of the surface 52, and a shouldering portion 58 extending radially inwards, with respect to the axis 43, from the cylindrical face 54. The cylindrical mandrel includes a rounding 60 between an outer radial edge, with respect to the axis 43, of the surface 52 and the outer cylindrical surface 44.

[0069] Referring to figure 1, the drifting device 2 includes two attachment sets 62 and 64. The attachment sets 62 and 64 are respectively located at each axial end of the body 12. The attachment set 62 is intended to support the end 48 of the cylindrical mandrel 42 and the attachment set 64 is intended to support the end 50 of the cylindrical mandrel 42. Hence, the attachment sets 62 and 64 are intended to link mechanically the cylindrical mandrel 42 to the body 12.

[0070] To that end, each of the attachment sets 62 and 64 includes three attachment parts 66 regularly distributed over the circumference of the cylindrical body 12. One attachment part 66 will now be described with reference to the figures 4A to 4D.

[0071] Namely, figure 4A shows an isometric view of an attachment part 66 in a relaxed configuration, figure 4B shows an isometric, partial cross-sectional view of the attachment part 66 in the relaxed configuration, figure 4C shows an isometric view of the attachment part 66 in a retracted configuration and figure 4D shows an isometric, partial cross-sectional view of the attachment part 66 in the retracted configuration.

[0072] The attachment part 66 includes a radial inner portion 68 at least partially received in an opening 70 of the body 12. In the depicted embodiment, the portion 68 and the opening 70 have a rectangular cross-section in the plane perpendicular to the radial direction. This allows having the attachment part 66 moveable in translation along the radial direction with respect to the body 12.

[0073] The attachment part 66 includes a radial outer portion 72. The radial outer portion 72 includes a frontal surface 74 radially outwardly delimited by a circular outer edge 76 having a diameter d_{76} . The frontal surface 74 is parallel to the vector X. The radial outer portion 72 includes a cylindrical surface 78. The cylindrical surface 78 is directed by the direction of the vector X, the generatrix being parallel to vector X and extends from the circular outer edge 36. The radial outer portion 72 includes a shoulder 80. The shoulder 80 is perpendicular to the direction of vector X. The shoulder 80 extends radially outwards from the cylindrical surface 78. The shoulder 80 is axially offset relative to the frontal surface 74.

[0074] Hence, when the cylindrical mandrel 42 is mounted on the body 12, it is possible to have the frontal surface 74 in axial contact with the shouldering portion

58, the cylindrical surface 78 in radial contact with the cylindrical face 54 and the shoulder 80 in contact with the axial surface 52. In other words, a contact surface is formed by the frontal surface 74 and the shoulder 80 to be in axial contact with an end 48 or 50 of the cylindrical mandrel 42.

[0075] As visible on the cross-sectional views of figures 4B and 4D, a helical spring 82 is inserted inside the opening 70, between the body 12 and an inner shoulder 84 of the attachment part 66. The spring 82 forms an elastic return to recall the attachment part 66 towards its relaxed position as depicted on figure 4A and 4B.

[0076] The attachment part 66 includes a locking device 86, such as a screw 86 including a head in axial contact with the inner shoulder 84, and a threaded portion cooperating with a threaded bore 88 extending radially inwards from the opening 70.

[0077] In order to perform a drifting method of a tubular good, the drifting device 2 may be introduced together 20 with the cylindrical mandrel 42 inside the tubular good. More specifically, the cylindrical mandrel 42 is attached to the body 12 by means of the attachment part 66. In such conditions, the cylindrical mandrel 42 may move in 25 rotation around two axes respectively parallel to the vectors Y and Z and in translation along the direction of the vectors Y and Z. Hence, the same drift test is implemented as when a conventional drift mandrel is passed through the tubular good.

[0078] When the degrees of mobility do not allow the 30 cylindrical mandrel 42 to pass through a portion of the tubular good, the cylindrical mandrel 42 is blocked and the drifting device 2 goes back to its starting point. Hence, the cylindrical mandrel 42 may be removed from the tubular good and the traversability of the tubular good is 35 considered unproper.

[0079] In the meantime, length and inner diameter 40 measurements may be implemented by means of the length encoder 38 and the metering device 40. Since it allows implementing a drifting method and measuring the inner diameter of the tubular good, the drifting device can achieve two operations at the same time leading to operational savings on field.

[0080] If it is necessary to use a cylindrical mandrel having different dimensions, one may replace the cylindrical mandrel with another one by performing, successively, the following steps:

- removing the locking device or screw 86,
- removing the attachment part 66,
- replacing the springs 82 with springs having a different relaxed length,
- inserting the attachment part 66 and tightening the locking device or screw 86.

[0081] Hence, the diameter d_{76} of the attachment parts 66 in relaxed position may be increased and decreased in order to adapt the attachment parts 66 to a mandrel having different dimensions, namely a different inner

and/or outer diameter. Thus, the drifting device 2 may be used with different cylindrical mandrels in order to perform drifting methods with tubular goods having different inner diameters.

[0082] Referring now to figure 5, it is shown and adapter 90. The adapter 90 includes an inner portion 92 and an outer portion 94. The inner portion 92 mainly comprises an inner circular edge having a diameter d_{92} substantially equal to the diameter of the cylindrical outer edge 76 on figures 4A. By virtue of this arrangement, the inner portion 92 may be in radial contact, by its circular edge, with the cylindrical surface 78 and in axial contact with the shoulder 80.

[0083] The outer portion 94 includes a plurality of through bores 96 so arranged to receive respective screws (not depicted). The screws are intended to cooperate with blind bores (not depicted) made in the axial ends 48 and 50 of the cylindrical mandrel. By virtue of this arrangement, the outer portion 94 may be attached to a cylindrical mandrel even if the inner diameter of the cylindrical mandrel is higher than the diameter d_{76} of the attachment parts 66 in relaxed position. Hence, one may use a drifting device 2 even when the drifting method has to be implemented with a tubular good having a diameter much larger than the usual tubular goods.

[0084] Referring now to figure 6, it is depicted an attachment part 100 according to another embodiment of the invention. Same elements have the same references.

[0085] The attachment part 100 differs from the attachment part 66 in that the radial outer portion 72 includes a tapered contact surface 102. The surface 102 is intended to be in axial contact with an end 48 or 50 of the cylindrical mandrel 42.

[0086] The attachment part 100 thus provides an alternative embodiment to attach the cylindrical mandrel 42 to the body 12, and a variant in order to allow centering the cylindrical mandrel 42 around the axis 14.

[0087] Referring now to figure 7, a drifting device 114 according to another embodiment of the invention is depicted. Same elements have the same references.

[0088] The drifting device 114 differs from the drifting device 2 in that the metering device 40 includes, instead of the laser triangulation sensor 112 and of the inclined mirror 110, a laser triangulation sensor 116 affixed to the plate 108. The laser sensor 116 is so arranged to emit a radially directed laser beam 118. Thus, the internal inspection device 114 provides an alternative arrangement for the measure of the inner diameter of the tubular good.

[0089] In the embodiment depicted on figure 7, the internal inspection device 114 includes one supplementary laser triangulation sensor 120. The laser beam 118 emitted by the laser sensor 120 is radially directed and in opposite direction to that of the laser beam 118 emitted by the laser sensor 116. The measure of the inner diameter of the tubular good is thus rendered even more accurate.

Claims

1. Drifting device (2) for a tubular good including a body (12), an actuator for propelling the body (12) through the tubular good, and at least one attachment part (66, 100) for attaching a cylindrical mandrel (42) to the body (12), wherein the attachment part (66, 100) is so configured to enable a degree of mobility of the cylindrical mandrel (42) with respect to the body (12) along a radial direction.
2. Drifting device (2) according to claim 1, wherein the attachment part (66, 100) is so configured to enable a degree of rotation of the cylindrical mandrel (42) around a first radial direction, a degree of rotation of the cylindrical mandrel (42) around a second radial direction, the second radial direction being not parallel to the first radial direction,
3. Drifting device (2) according to claim 2, wherein the attachment part (66, 100) is so configured to further enable a degree of translation of the cylindrical mandrel (42) along the first radial direction and a degree of translation of the cylindrical mandrel (42) along the second radial direction.
4. Drifting device (2) according to one of claims 1 to 3, further including a distance sensor for measuring (38, 40) an inner diameter of the tubular good and/or a length of the tubular good.
5. Drifting device (2) according to any of claims 1 to 4, including an elastic means located between the attachment part (66, 100) and the body (12).
6. Drifting device (2) according to claim 5, wherein the elastic means includes a spring, preferably a helical spring (82).
7. Drifting device (2) according to any of claims 1 to 6, wherein the attachment part (66, 100) includes a contact surface (74, 80, 102) intended to be in axial contact with an axial surface (52) of the cylindrical mandrel (42), the contact surface (102) being preferably tapered.
8. Drifting device (2) according to any of claims 1 to 7, wherein the body (12) includes an opening (70), the attachment part (66, 100) being received in the opening (70) and including a locking device (86) for releasably preventing the attachment part (66, 100) from leaving the opening (70).
9. Drifting device (2) according to any of claims 1 to 8, wherein the body (12) is elongated, the attachment part (66) including a frontal surface (74) perpendicular to a longitudinal direction (14) of the body (12), the frontal surface (74) including a circular outer

edge (76), the attachment part (66) including a cylindrical surface (78) with a generatrix in the longitudinal direction (14) and extending from the circular outer edge (76), and a shoulder (80) perpendicular to the longitudinal direction (14) and extending outwards from the cylindrical surface (78). 5

10. Drifting device (2) according to any of claims 1 to 9, including a plurality of attachment parts (66, 100) forming a first attachment set (62) and a second attachment set (64), the first and second attachment sets (62, 64) being axially spaced apart from each other. 10
11. Drifting device (2) according to claim 10, wherein each attachment set (62, 64) includes at least three attachment parts (66, 100) regularly distributed over the circumference of the body (12). 15
12. Drifting device (2) according to any of claims 1 to 11, further including a cylindrical mandrel (42) attached to the body (12) via the attachment part (66, 100). 20
13. Drifting device (2) according to claim 12, further including an adapter (90) comprising an outer portion (94) directly attached to an axial end (48, 50) of the cylindrical mandrel (42) and an inner portion (92) in direct contact with the attachment part (66, 100). 25
14. Drifting device (2) according to any of the preceding claims, further comprising a metering device (40) for metering an inner diameter of the tubular good. 30
15. Drifting device (2) according to claim 14, wherein the metering device (40) comprises a laser triangulation sensor (112, 116, 120). 35
16. Drifting method for verifying internal dimension of a tubular good, wherein a cylindrical mandrel (42) is attached to an attachment part (66, 100) of a drifting device (2) according to any of claims 1 to 15, and the drifting device (2) is propelled inside the tubular good. 40
17. Drifting method according to claim 16, further including a step of measuring an internal diameter of the tubular good and/or a length of the tubular good, the steps of measuring and the step of propelling the drifting device (2) inside the tubular good being performed simultaneously. 45

FIG. 1

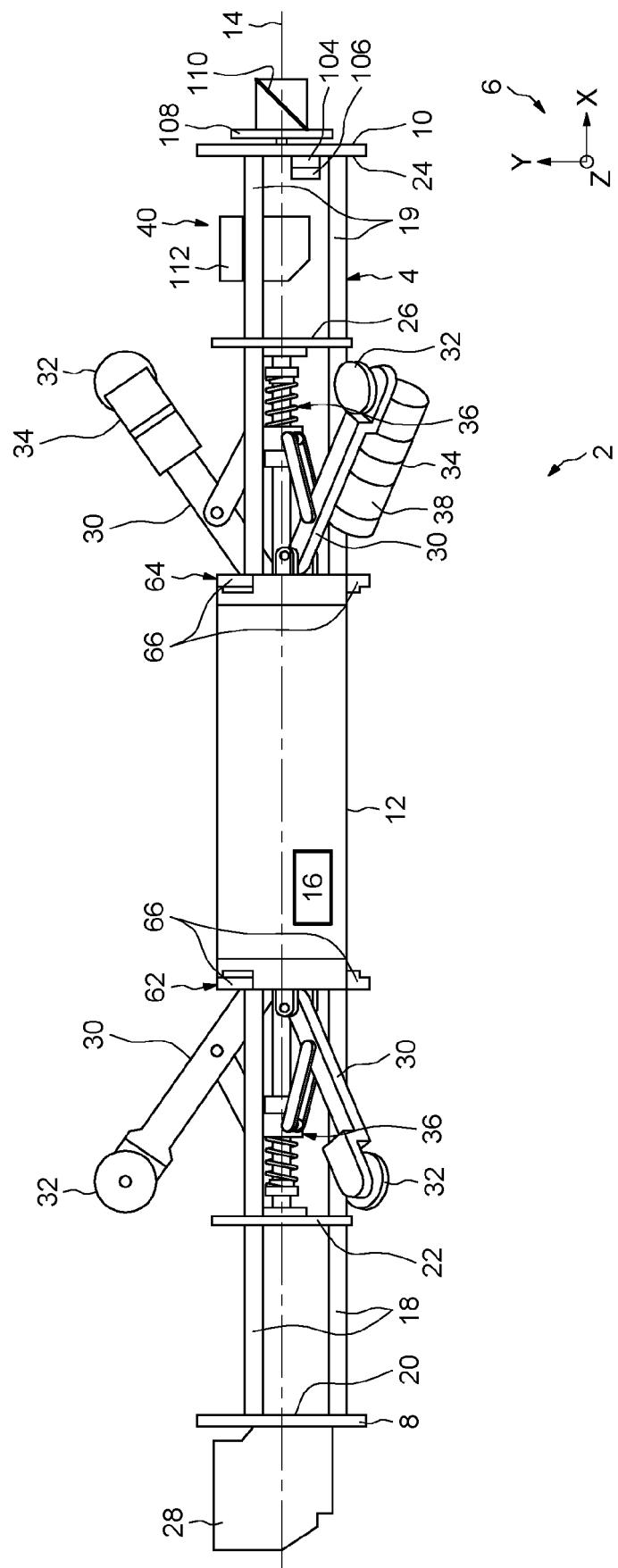


FIG.2

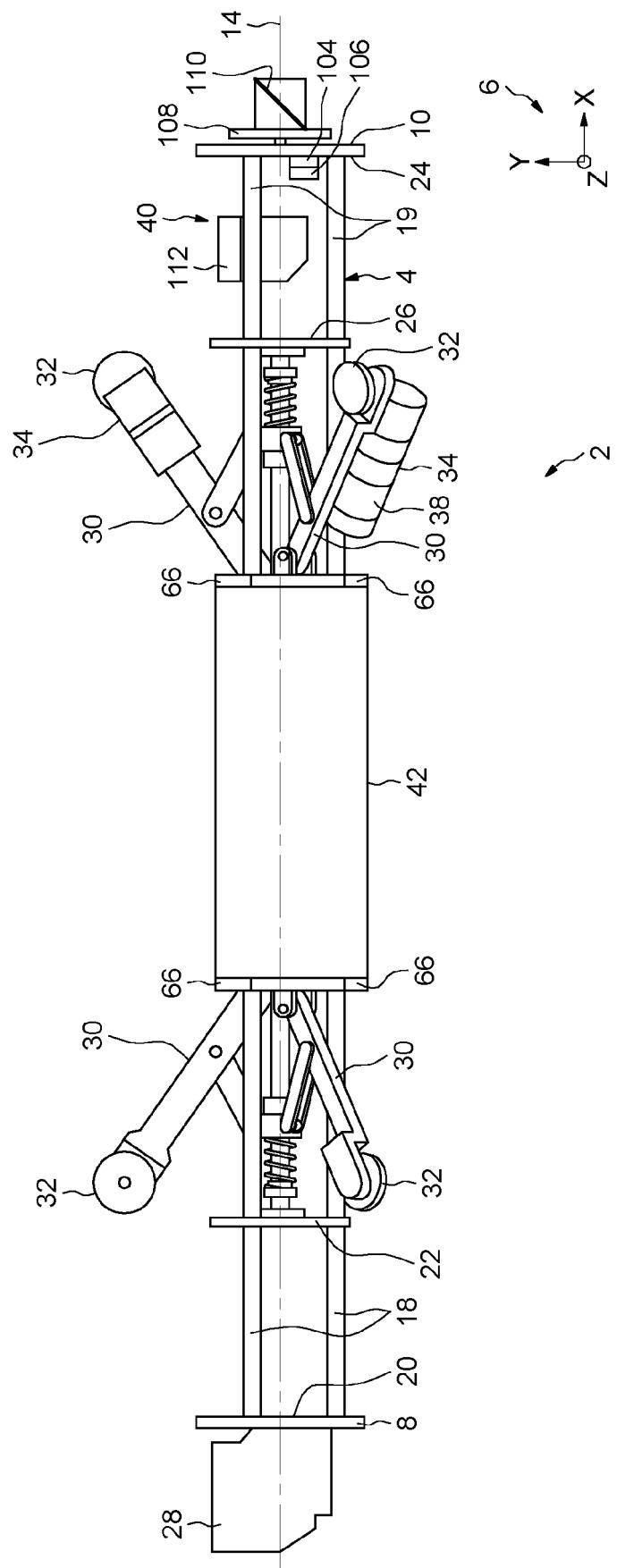


FIG.3

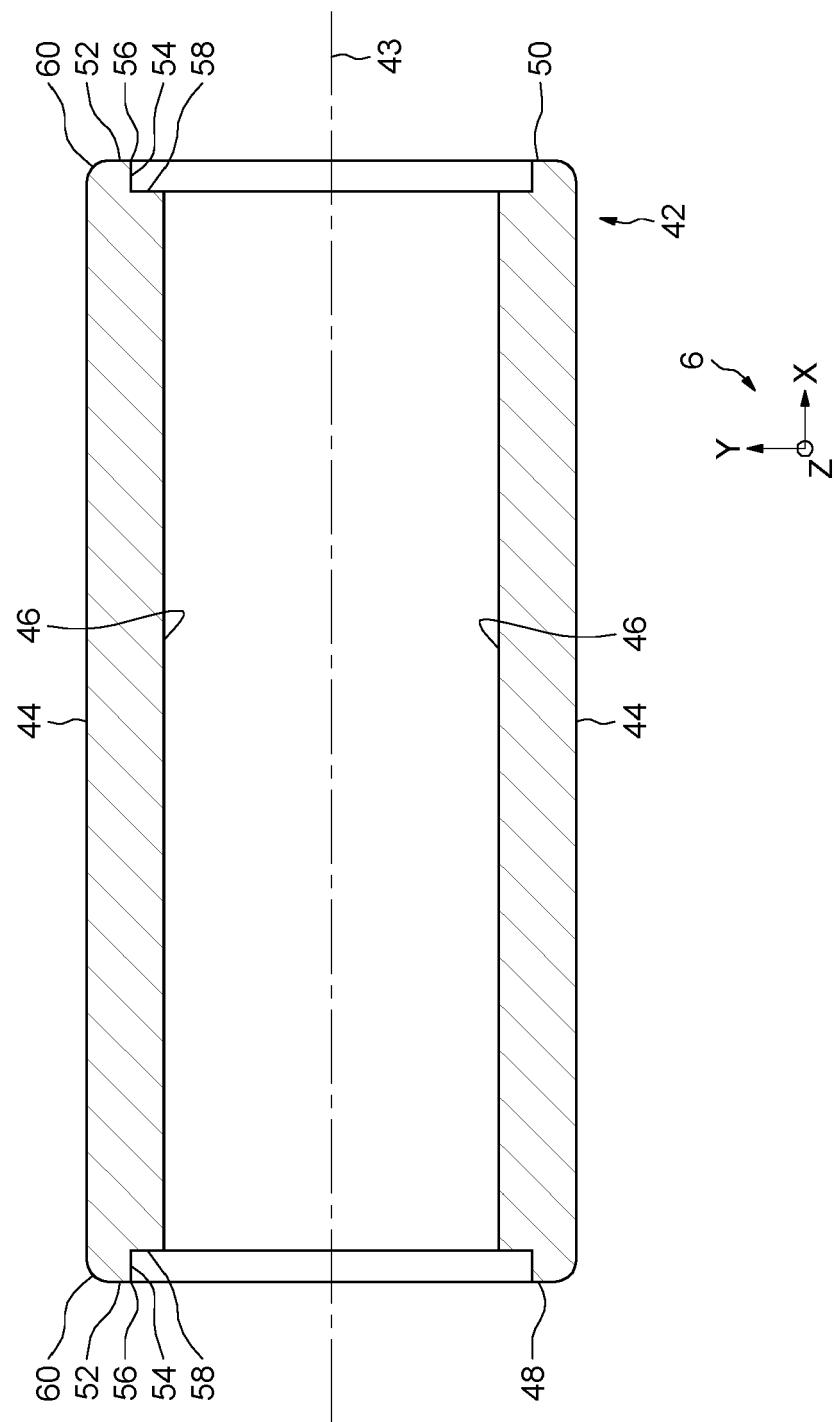


FIG.4A

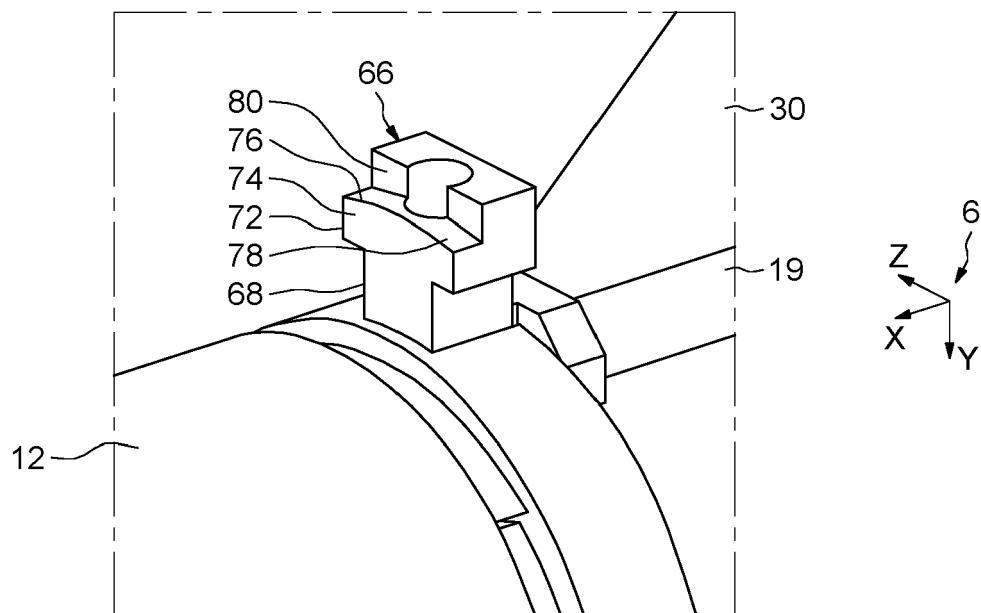


FIG.4B

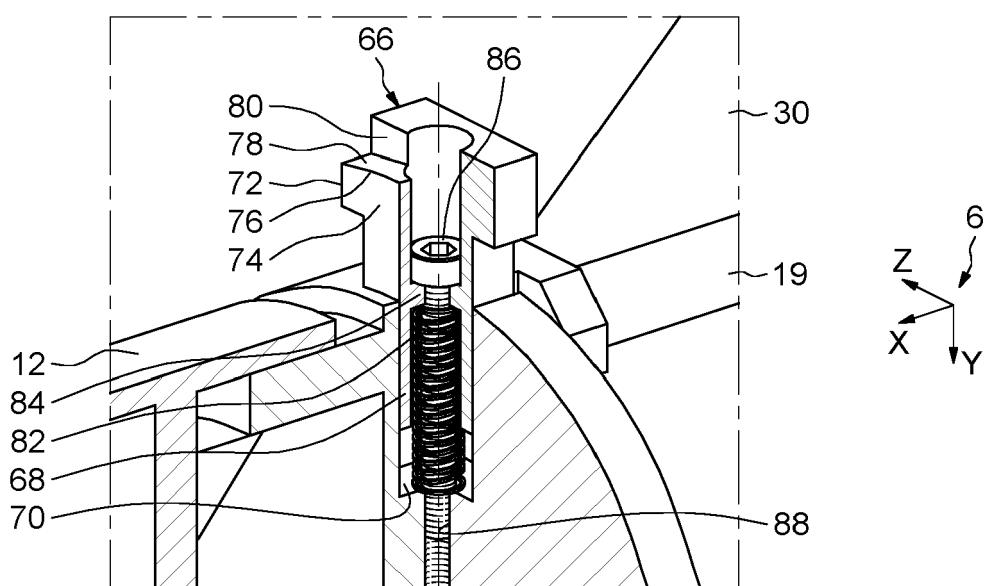


FIG.4C

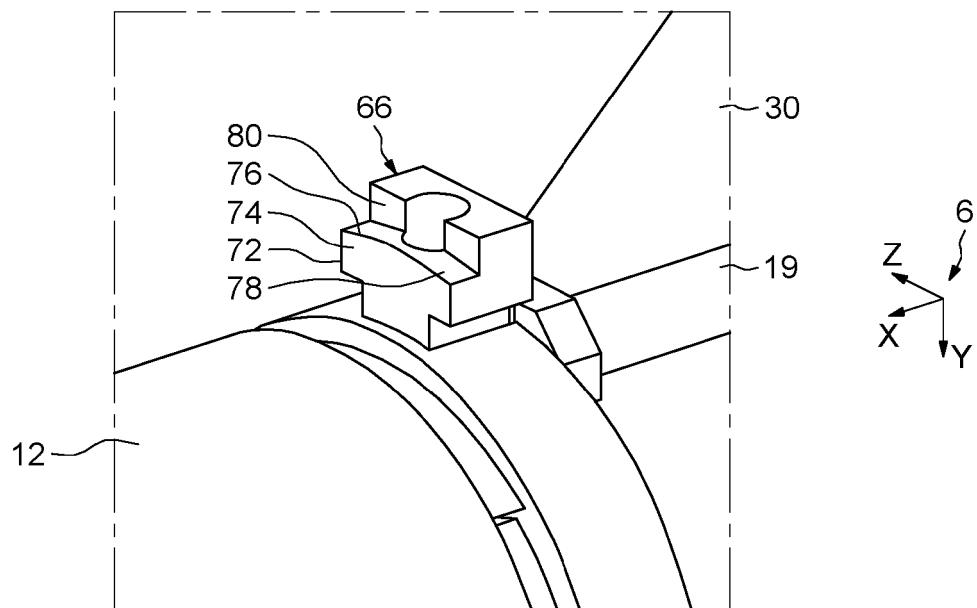


FIG.4D

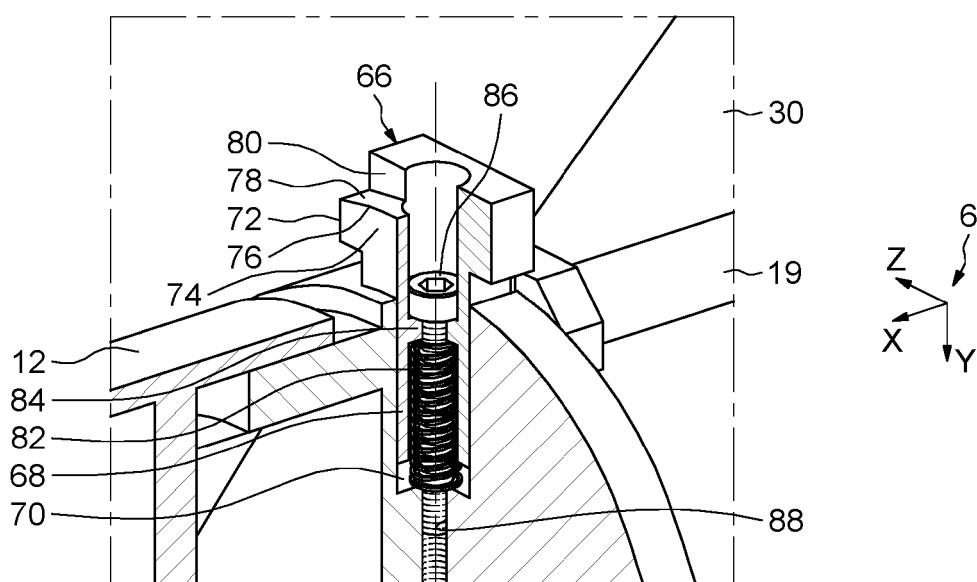


FIG.5

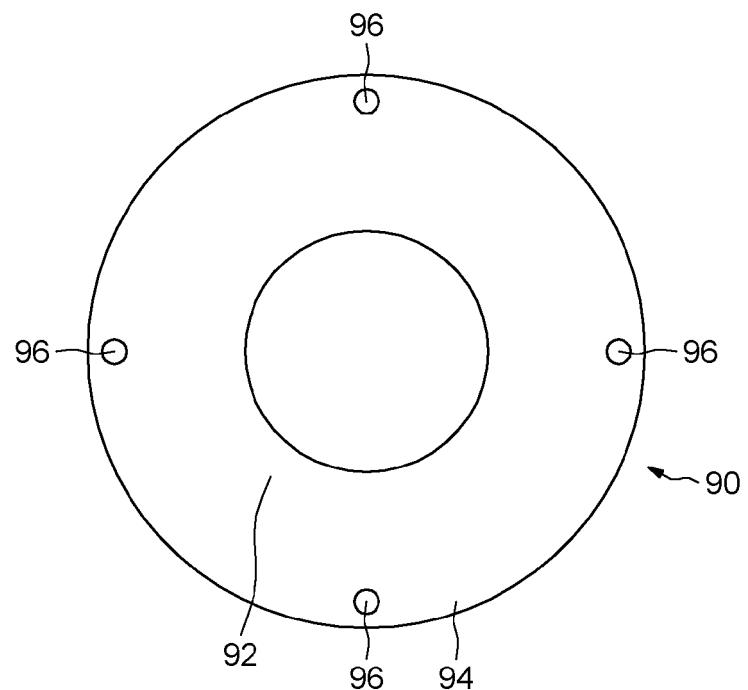


FIG.6

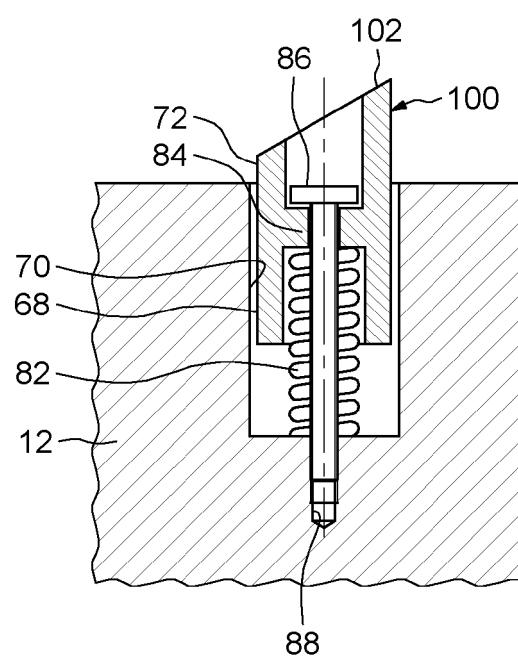
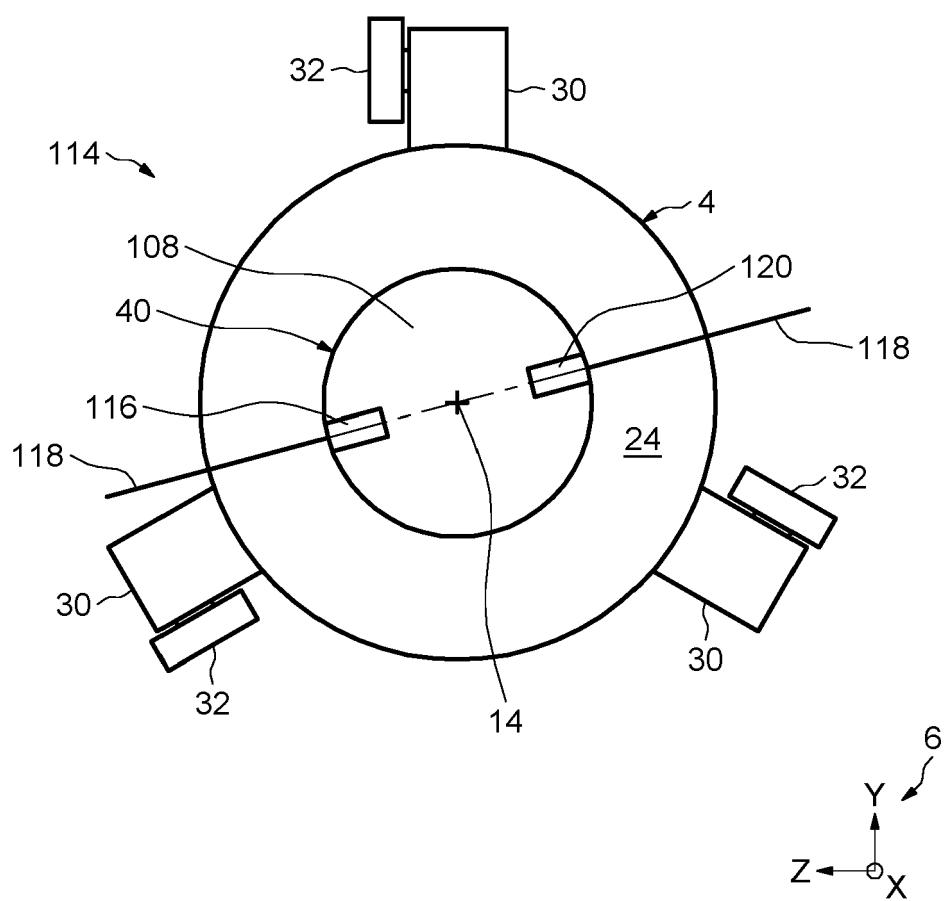


FIG.7





EUROPEAN SEARCH REPORT

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5

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 109 000 085 A (UNIV XIHUA) 14 December 2018 (2018-12-14)	1-8, 10-12, 14, 16, 17	INV. F16L55/32 E21B47/08
Y	* figures 1-4 *	15	F16B1/00
A	* abstract *	13	G01B5/12 G01B7/13
X	----- CN 103 398 665 A (UNIV INNER MONGOLIA TECHNOLOGY) 20 November 2013 (2013-11-20)	1-7, 10, 11, 14, 16, 17	G01B11/02 G01B11/06 G01B11/12
Y	* figures 1-4 * * abstract *	15	G01B21/14 G01S7/00 F16L55/40
X	----- CN 209 325 274 U (CHANGQING PETROLEUM EXPLOR BUREAU CO LTD TECHNICAL MONITORING CENTER) 30 August 2019 (2019-08-30)	1-5, 7-11, 14, 16, 17	
Y	* figures 1, 2, 6 * * abstract *	15	
Y	----- DE 10 2017 004475 A1 (NOLL ALBRECHT [DE]; WEIRICH BASTIAN [DE]) 15 November 2018 (2018-11-15) * the whole document *	15	
A	----- KR 2017 0035047 A (SAMSUNG HEAVY IND [KR]) 30 March 2017 (2017-03-30) * the whole document *	1, 16	F16L E21B F16B G01B G01S
The present search report has been drawn up for all claims			
1	Place of search	Date of completion of the search	Examiner
50	EPO FORM 1503 03-82 (P04C01) Munich	20 January 2021	Prieto Sanz, M
55	CATEGORY OF CITED DOCUMENTS	T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
	X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-01-2021

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	CN 109000085 A	14-12-2018	NONE	
15	CN 103398665 A	20-11-2013	NONE	
	CN 209325274 U	30-08-2019	NONE	
20	DE 102017004475 A1	15-11-2018	NONE	
	KR 20170035047 A	30-03-2017	NONE	
25				
30				
35				
40				
45				
50				
55				

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82